Multi-Sweep

121B

KAY ELECTRIC COMPANY

INSTRUCTION MANUAL
Issue B

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MULTI-SWEEP

Model 121-B

SWEEPING OSCILLATOR

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SECTION I, GENERAL INFORMATION

1-1 INTRODUCTION.

The Multi-Sweep 121-B is a basic rack unit sweeping oscillator and marker generator, which accepts replaceable r-f heads to cover a wide range of swept frequencies. Typical coverage is 500 kc to 1050 mc, or 900 to 1300 mc, depending on head in use. Variable center frequency and sweep width controls permit operation of the Multi-Sweep over any portion of these frequency ranges.

The sweep voltages generated have sawtooth waveshapes and no phasing adjustments are necessary. Blanking of the r-f output during CRO retrace time provides a zero-voltage reference. External signals, such as a sine wave, or triangular wave, at frequencies down to 1 cps and up to 20 kc may be used to modulate the sweep oscillator, and drive the X-axis amplifiers in the CRO.

The swept output is agc'd and metered, and a built-in attenuator permits insertion of precise steps of attenuation ahead of the output jack. A direct-reading 0-300 mc digital frequency dial provides center frequency control at VHF, and vernier control at UHF. A built-in detector is provided for added convenience.

Fixed frequency harmonic markers may be obtained when optional circuitry is included. Markers at multiples of 1, 10 and 100 mc are standard. A variable birdie pip marker can be developed through the use of an external c-w generator. All markers are available at a separate output jack on the panel, with separate marker amplitude control.

1-2 SPECIFICATIONS.

VHF: (Using the 500 kc - 1050 mc head).

Frequency Range:	500 kc to 300 mc.
Sweep Width:	50 kc to 300 mc.
Output:	0.5 volt rms, terminated.
Harmonic Distortion:	More than 30 db down.
Spurious:	More than 30 db down.
Impedance:	50 ohms.
Flatness:	±0.25 db.

UHF: (Using the 500 kc - 1050 mc head).

Frequency Range:	200 to 1050 mc.
Typical Sweep Widths:	750 to 1050 mc, 500 to 750 mc, 200 to 240 mc.
Sweep Rate:	30 to 60 cps, variable; can be externally driven from 1 cps to more than 20 kc.
Output:	0.5 volt rms, terminated.
Impedance:	50 ohms.
Flatness:	±0.25 db, 200 - 800 mc; ±0.5 db, 800 - 1050 mc.
Harmonic Distortion:	More than 30 db down.

UHF: (Using Type P-122A r-f head).

Frequency Range: 900 to 1300 mc.

Flatness: ±0.5 db, 900 - 1300 mc.

Other specifications same as the 500 kc - 1050 mc head.

Attenuator: Steps of 0, 10, 20, 30, 40, 50 and 60 db.

Markers: a) Provision for development of variable marker(s).

b) (Optional) Harmonic markers at multiples of 1, 10 and 100 mc.

Power Input: 117v (±10%), 50 - 60 cps, 140 watts. (230v with wiring change).

Dimensions: 19-3/8" x 10-7/8" x 16-1/8".

Weight: 55 lbs.

1-3 SHIPPING DAMAGE.

As soon as the Multi-Sweep 121-B is received, it should be visually inspected to determine that it was not damaged during shipment. A careful check of packing case contents should be made to insure removal of all items shipped. Shortage or damage should be reported immediately to the Carrier and Kay Electric Company, or its representative in the area.

Equipment Supplied. The Multi-Sweep 121-B is shipped complete in metal cabinet, with built-in power supply. Other auxiliary equipment and interconnecting cables referred to in this manual are not furnished.

1-4 INSTALLATION.

Interconnection of Equipment. Typical interconnections between equipment are shown in Figs. 1-1 and 1-2. All connections, unless otherwise specified, should be made with coaxial cable of proper impedance. All leads should be kept as short as possible, consistent with placement of equipment. Output impedance of the Multi-Sweep 121-B is 50 ohms. The RF Out terminal should be terminated in 50 ohms whenever the 121-B is in operation, regardless of whether or not the r-f output is used.

Removal of the r-f head from the rack is accomplished by loosening the four knurled thumb screws and pulling the head partially out of the receiving well. Disconnect the two connectors joining the cables. The r-f head may now be completely withdrawn from the rack.

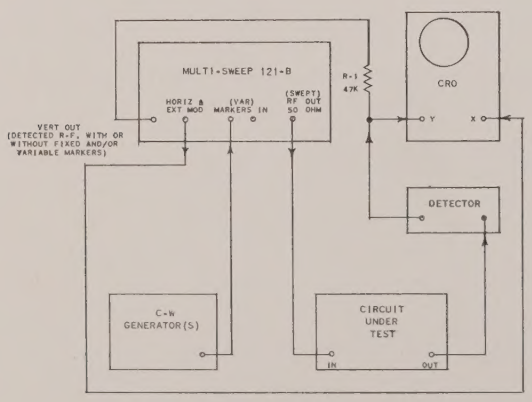


Fig. 1-1 Typical interconnections between equipment, using variable or Line-Lock sweep mode and c-w generator to develop a variable birdie marker.

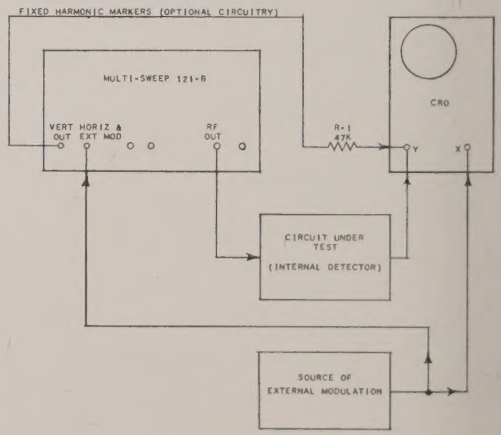


Fig. 1-2 Typical interconnections between equipment, using external source of modulation to control rep-rate of 121-B and drive CRO X-axis amplifiers.

1-5 FUNCTION OF EXTERNAL CONTROLS.

CONTROL	POSITION	FUNCTION
EXT MOD, VAR, LINE LOCK Switch S-2.	Ext Mod	Permits use of an external signal at sweep rates from 1 cps to 20 kc.
	Var	Permits use of the Variable Rep Rate control to provide sweep rates between 30 and 60 cps.
	Line Lock	Sweep may be locked to line frequency by adjusting the Variable Rep Rate control.
VARIABLE REP RATE Pot. R-127.	Variable	Used to select desired sweep rep rate when Ext Mod-Var-Line Lock switch is set to Var or Line Lock. Rep rate may be varied between 30 and 60 cps, or locked to line frequency.
BLANKING ON Switch S-4	On-Off	The swept r-f output is blanked during CRO retrace time, providing a zero-voltage baseline.
UHF-VHF Switch S-1	UHF	Used to select mode of operation. Swept range is 500 kc to 1050 mc, or 900 to 1300 mc, using P-122A head.
	VHF	Swept range is 500 kc to 300 mc, using 500 kc to 1050 mc head. The VHF setting is not useable with the P-122A head.
UHF CENTER FREQUENCY (TUNE)	Variable	(Located on plug-in panel). Used to select center frequency of swept r-f output when UHF-VHF switch is set to UHF.
VHF CENTER FREQUENCY R-130	Variable	When both the UHF-VHF switch and UHF Center Frequency dial is set to VHF position, center frequency of the swept r-f output is selected by the digital readout control.
VAR RF LEVEL ADJ Pot. R-103	Variable	Used to vary amplitude of swept r-f output over a 3-db range.
SWEEP WIDTH Switch S-3	NAR-WIDE	Determines the range of the Sweep Width control.
SWEEP WIDTH Pot. R-135	Variable	Sweep width can be varied within the range selected by the Sweep Width switch
MARKER GAIN Dual control R-68/S-6.	Variable	Used to adjust amplitude of birdie markers. (On - Off switch S-6 is ganged with R-68).
HARMONIC MARKERS Switch S-8	Off, 1, 10, 100 mc.	(Optional) Fixed markers at multiples of 1, 10 or 100 mc may be generated, according to the setting of this switch. These markers appear at the Vert Out jack.
RF ATTENUATOR	Stepped	Precise steps of attenuation in 0, 10, 20, 30, 40, 50 and 60 db increments can be inserted by this control.

I-6 FUNCTION OF INTERNAL CONTROLS.

CONTROL	FUNCTION
UHF Oscillator, V-1 Potentiometer R-5	R-5 is ganged with UHF Center Frequency control and adjusts UHF oscillator bias.
VHF Oscillator Q-1 Frequency Adjustment Capacitor C-11	Sets frequency of local oscillator Q-1.
UHF and VHF Meter Adjustment Pots. R-56 and R-58	Used to calibrate the output meter for both UHF and VHF modes of operation
UHF and VHF OUTPUT Adjustment Pots. R-60 and R-61	Maximum r-f output is established at approx. 0.5 db above 0.5v rms by adjusting these controls for the UHF and VHF modes.
Low Frequency Adjustment Pot. R-134	Used to establish the reference bias at Sweep Shaper stage V-2.
High Freq. Adj., R-141; Low Freq. Lin Adj. and Mid-Freq. Lin Adj. Pots, R-138 and R-145	Used to adjust tracking of the digital center frequency dial.
Centering Nar. Swp. Pot. R-150	Sets Centering for narrow sweep operation.
-30 Volts Adj. Pot. R-92	Used to set the voltage for the -30v supply.
DC Fil. Voltage Adj. R-97	Sets +6.3 d-c filament supply voltage.

I-7 IDENTIFICATION OF TERMINALS.

TERMINAL	FUNCTION
RF OUT 50 Ohms	This is the 50 ohms terminal for the swept r-f output.
DET IN J-4	The detector is used for self-check of vertical sweep.
VERT OUT J-5	The detected signal appears at this jack and may be connected directly to the Y-axis input terminal of the CRO. The markers are superimposed on this output.
MARKERS IN J-3, J-15	If a variable marker is desired, the output from an external c-w generator is connected to one of these jacks. A second variable marker may be obtained by connecting the output from a second c-w generator to the remaining jack.
HOR and EXT MOD, J-6	When using either variable or line lock sweep mode, a sawtooth voltage, synchronized with the swept r-f output is available at this jack, and is normally used to drive the CRO X-axis amplifiers. When the Ext Mod-Var-Line Lock switch is set to Ext Mod, an external signal may be fed into the Hor and Ext Mod jack to control sweep rep rate. When external modulation is used, the modulating signal source is also used to drive CRO X-axis amplifiers.

SECTION II, OPERATION

2-1 OPERATION.

A. UHF Operation. Interconnect the 121-B and associated equipment as in Fig. 1-1. Turn equipment on and allow a few minutes warm-up time to stabilize the circuits.

Set UHF-VHF switch to UHF position and digital VHF Center Frequency dial to 150. (Dial readings are a guide rather than an accurate frequency calibration.) Adjust the Tune control until UHF Center Frequency dial indicates desired sweep center frequency. Set the mode selector switch to Line Lock and adjust Variable Rep Rate control to lock CRO trace at 60 cps.

If variable rep rate or external modulation function is used, follow instructions in paragraphs D and F.

Set Var RF Level Adj control and RF Attenuator to provide vertical deflection within input amplitude requirements of device under test, and for easy viewing on the CRO screen.

Sweep width adjustments (Sweep Width switch and Variable sweep width control) should be made to display desired portion of response curve, consistent with information sought. Controls are normally set to provide sweep width two or three times passband of device under test. (Instructions for narrow sweep operation are furnished in paragraph C.)

B. VHF Operation. Operation in the VHF mode is similar to that for UHF.

Set UHF-VHF switch to VHF and UHF Center Frequency dial to VHF Set. Set digital center frequency control to number corresponding to desired sweep center frequency.

Note; When Type P-122A sweep oscillator plug-in is in use, the UHF-VHF switch must be set to UHF.

C. Narrow Sweep Width Operation. The narrow sweeps provide optimum stability over their range.

1. Narrow Sweep Widths, UHF Mode. (Sweep widths up to 4 mc may be obtained, depending on center frequency of oscillator.)

   a. Set UHF-VHF switch to UHF position.

   b. Set UHF Center Frequency control to desired center frequency.

   c. Set Sweep Width switch to Nar.

   d. Set variable Sweep Width control for desired sweep width.

   e. To change center frequency, adjust UHF Center Frequency control. VHF Center Frequency adjust may be used as a vernier and will change center frequency up to 5 mc, depending on setting of variable Sweep Width control and center frequency of the oscillator.

The 121-B will not operate in the UHF mode above 900 mc with Sweep Width switch set to Nar. To obtain narrow sweep widths above 900 mc, set Sweep Width switch to Wide position and adjust Variable Sweep Width control for desired sweep width. Center frequency may be varied across frequency range of sweep plug-in in use with VHF Center Frequency control.

2. Narrow Sweep Widths, VHF Mode. (Sweep widths up to 4 mc may be obtained.)

   a. Set UHF Center Frequency control to VHF Set.

b. Set UHF-VHF switch to VHF.

c. To operate with narrow sweep widths below 150 mc, set Sweep Width switch to Nar, and locate desired center frequency with UHF Center Frequency control. (To locate center frequency, use a variable birdie pip marker, as described in paragraph H.) Adjust variable Sweep Width control to obtain desired sweep width.

d. To operate with narrow sweep widths above 150 mc, set Sweep Width switch to Wide, and locate desired center frequency with VHF Center Frequency control, as in C above. Adjust Sweep Width control to obtain desired sweep width.

In VHF position, with Sweep Width switch in Nar position, the VHF Center Frequency control is no longer a direct frequency readout of VHF center frequency, but acts only as a fine frequency control and will change center frequency up to approximately 5 mc, depending on setting of Variable Sweep Width control.

D. Variable Repetition Rates. A repetition rate variable between 30 and 60 cps may be obtained by setting the sweep mode switch to Var position. The Variable Rep Rate control is then used to select the desired sweep rep rate. Rate selected should be fast enough to retain as much of the pattern as possible on the CRO screen, while still maintaining correct response curve.

A variable rep rate is useful when checking the response of circuits having sharp variations in amplitude. In such cases, the slower rep rates will disclose sharp variations which faster rates may not 'see'. Another advantage of the variable rates becomes apparent when a circuit exhibits 60-cycle hum. If such a circuit is swept at a 60-cps rate, or one of its harmonics, the response curve is distorted. If the rate is changed to other than 60 cps, the response curve will exhibit oscillation, indicating hum.

E. Blanking. With Blanking switch set to On, and Ext-Var Line-lock switch set to Var or Line Lock position, a zero-voltage baseline is developed on the CRO screen. This permits amplitude measurements to be made directly on the CRO display. When external modulation is used, the blanking circuits are disabled and the CRO displays both a forward and reverse sweep.

F. External Modulation. Sweep rep rates from 1 cps to 20 kc may be obtained by using an external low-frequency oscillator. A signal of approximately 20 volts p-p is required to obtain maximum sweep width, and should be applied to the Horiz and Ext Mod jack. Set the Ext Mod-Var-Line Lock switch to Ext Mod. Interconnect equipment as in Fig. 1-2.

G. Internal Detector. For convenience, an internal 50-ohm detector is provided to detect the swept r-f output. If the output of the circuit under test is other than 50 ohms, an external detector having appropriate impedance should be used. The internal detector may be used for a self-check of r-f output characteristics. To do this connect the 121-B and CRO as shown in Fig. 2-1.

H. Markers. Circuitry for developing fixed-frequency harmonic markers is optional, however, one or two variable markers can be developed through use of one or two external c-w generators.

A variable marker is developed by applying the output from the c-w generator to one of the Markers In jacks. Marker frequency corresponds to the output frequency of the c-w generator, and depending on the frequency range of the c-w generator, the marker may be moved over the swept range of the 121-B. This type of marker is referred to as a birdie pip marker, and is superimposed on the detected output. Marker amplitude is adjustable with the Marker Gain control.

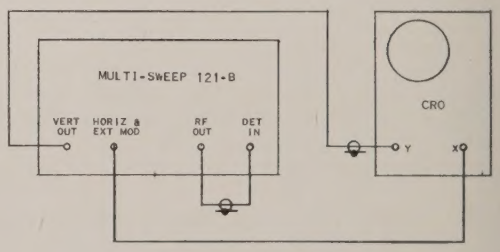


Fig. 2-1 Interconnection of 121-B and CRO for self-check of detected r-f output.

Note- A single birdie pip marker will be produced if amplitude of the c-w input to the 121-B is suitably low. High input amplitudes will produce harmonicly related birdie pip markers which will appear on the CRO trace (if sweep frequency and width are compatible).

If the optional harmonic markers circuit is incorporated in the 121-B, fixed-frequency markers at multiples of 1, 10 or 100 mc may be selected with the Harmonic Markers switch. These markers appear in the familiar picket-fence configuration. If desired, both the fixed markers and one or two variable markers may be used simultaneously.

SECTION III, CIRCUIT DESCRIPTION

3-1 CIRCUIT DESCRIPTION.

A. Sweep Circuits. Sweep generator V-1 operates in a Phantastron circuit and develops a sawtooth voltage across Sweep Width control R-135A. The setting of this control determines the amplitude of the signal passed to the grid in Section A of sweep shaper V-2. The settings of R-134, 141, 145 and 138 determine the operating characteristics of this tube; these controls being set to obtain correct wave shape to sweep the UHF oscillator linearly. In addition to shaping the sawtooth, V-2 amplifies and shifts phase 180° so that the signal at the plate is positive-going. Section B of this tube is a cathode follower. See Block Diagrams in Figs. 3-1 and 3-2.

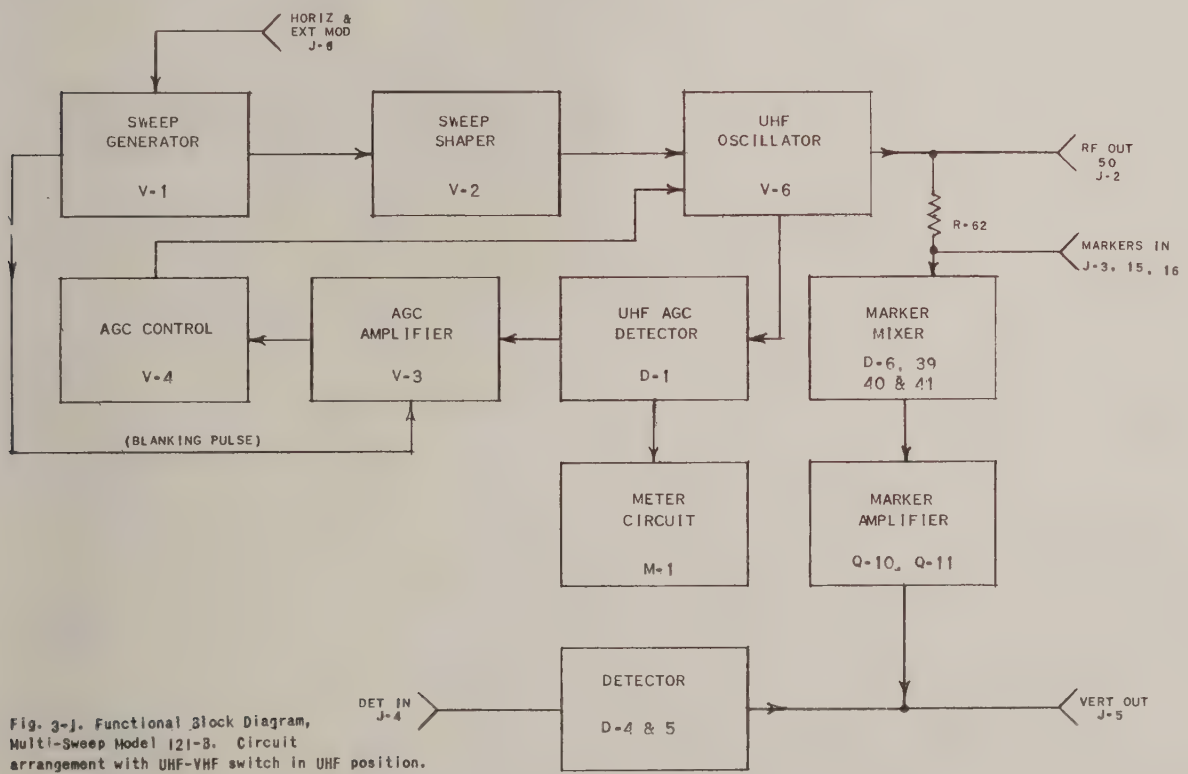


Fig. 3-1. Functional Block Diagram, Multi-Sweep Model 121-B. Circuit arrangement with UHF-VHF switch in UHF position.

B. R-F Circuits. The output from section B of V-2 is fed to the tuned circuits of UHF oscillator V-6, consisting of voltage-variable capacitor C-4 and the shorted line in the plate circuit. The voltage change across C-4 (as related to the setting of the shorted line) determines the extent of oscillator frequency change. When the UHF-VHF switch is set to UHF, oscillator output is made available directly at RF Out jack J-2.

When the UHF-VHF switch is set to VHF, oscillator output is mixed in diode D-2 with the fixed c-w signal from local oscillator Q-1. The difference frequency is passed through transistor amplifier stages Q-2 thru Q-8, and made available at RF Out jack J-2.

C. AGC Circuits. The agc circuits consist of UHF and VHF agc detectors, agc amplifier V-3, and agc control tube V-4. When UHF-VHF switch is set to UHF, a sample of the r-f signal generated by V-6 is fed through R-2 to UHF agc detector D-1. The resultant d-c error voltage is then passed to the grid in section A of agc amplifier V-3, amplified and applied to the grids of agc control tube V-4. Agc'd voltage for V-6 is taken from the cathodes of V-4 to maintain a flat r-f output.

When the UHF-VHF switch is set to VHF, output is detected by diodes D-3 and D-36. The error voltage developed by these diodes is applied to the control grid of V-3 to defelop a correction voltage, as in the UHF mode. In both cases, agc'd plate voltage for V-6 is provided.

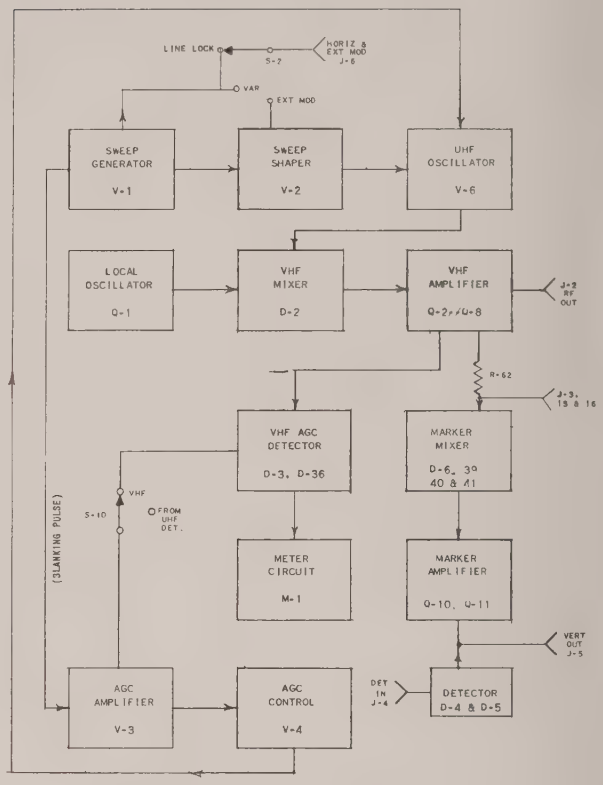


Fig. 3-2. Block Diagram, Multi-Sweep 121-B. UHF-VHF switch in VHF position.

D. Blanking Circuits. When Blanking switch S-4 is set to On, a negative-going pulse is applied to the grid in section B of V-3. This pulse is amplified, inverted, and appears at the screen grid in section A of agc amplifier V-3. This causes the tube to conduct heavily and increases the voltage drop across R-105, thus decreasing the plate voltage. This action also decreases the voltage on the grids of agc control tube V-4 and, therefore, the voltage at the cathodes. This decrease in voltage is sufficient to cut off the UHF oscillator, causing a zero-voltage baseline to develop on the CRO screen.

E. Marker Circuits.

1. Variable Birdie Pip Marker.

A variable marker is developed from an externally provided c-w signal and mixed with the swept rf in diode D-6. As the swept frequency approaches the c-w, a beat develops. Its signal amplitude increases, drops to zero at zero-beat frequency, and increases again as the swept frequency signal continues. The action produces a series of birdies which are amplified by V-5 and made available at J-5, the Vert Out jack. Depending on the amplitude of the c-w signal, harmonic birdies may be produced and will appear on the CRO screen, if sweep frequency and width are compatible.

Marker amplitude is adjustable with Marker Gain control, and may be turned on or off by S-6 which is ganged with this control.

By applying a second c-w signal to the other Markers In jack, a second variable marker will be developed.

2. Fixed Harmonic Markers.

If the optional harmonic markers circuit is incorporated, fixed frequency markers of the picket-fence type may be selected with Harmonic Markers switch, at frequencies which are multiples of 1, 10 and 100 mc.

Circuitry for generating the harmonic markers consists of a 100-mc crystal-controlled oscillator (Q-1, Q-2), a 10-mc multivibrator (Q-3, Q-4) and a 1-mc multivibrator (Q-5, Q-6). The output from these generators is mixed with the swept rf, and according to the selection made by the Harmonic Markers switch, a 1, 10 or 100 mc marker, plus harmonic markers are generated, amplified, and made available at J-5, the Vert Out jack.

F. R-F Detector Circuit. In order to obtain a detected envelope of the response curve for the device being tested, the output of the device is patched into Det In jack J-4. The external signal is detected by diodes D-4 and D-5 and the resultant signal made available at Vert Out jack J-5. In normal practice, the output at J-5 is patched to the Y-input terminal on the CRO.

G. Meter Circuit. The swept r-f output is continually monitored by meter M1, which is calibrated in rms volts and db. The RF Out jack must be terminated in 50 ohms to obtain an accurate reading. Appropriate shunts are placed in the meter circuit by the UHF-VHF switch to assure true readings for both the UHF and VHF modes of operation. Blanking switch S-4 shunts R-109 across the meter when blanking is off to maintain meter accuracy. UHF and VHF Meter Adjust potentiometers (R-56, R-58) are adjusted so that full-scale reading is 0.5 volt rms.

SECTION IV, MAINTENANCE

4-1 INTRODUCTION.

Instructions for accomplishing a periodic checkout of instrument performance, (without removing the 121-B from its cabinet) are given in this section. A more thorough alignment procedure is discussed, as well as suggestions for trouble-shooting the circuitry. Figs. 4-2 and 4-3 show location of major components.

4-2 PERIODIC INSPECTION.

A. Equipment Suggested.

a. Cathode-ray Oscilloscope, Tektronix Type 503, or equivalent.

b. Bolometer, Hewlett-Packard Type 430C Microwave Power Meter, using Model 477B Thermister Mount, or equivalent.

c. C-W oscillator(s) covering frequency range of the 121-B.

d. Coaxial patch cords with appropriate connectors.

e. VTVM, RCA VoltOhmyst, or equivalent.

B. Interconnection of Equipment. Interconnect the equipment as shown in Fig. 4-1. Turn equipment on and allow a few minutes warm-up time for the circuits to stabilize.

Initial Settings For Controls.

Attenuator switch set for zero db.

Var RF Level Adj control fully clockwise.

Blanking switch on.

Ext Mod-Var-Line Lock switch to Line Lock.

Sweep Width switch to Wide.

Variable Sweep Width Control Fully clockwise.

C. Check frequency coverage (200 to 1050 mc, using the 500 kc - 1050 mc head).

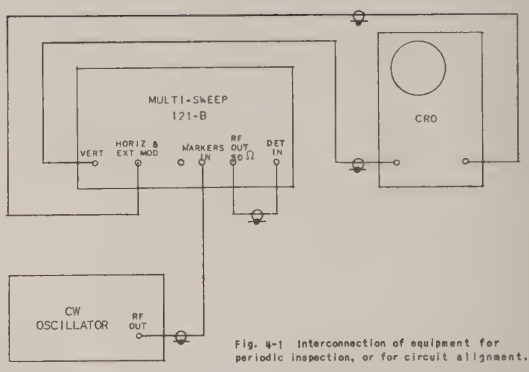


Fig. 4-1 Interconnection of equipment for periodic inspection, or for circuit alignment.

1. UHF Mode.

   a. Set UHF-VHF switch to UHF position.

   b. Adjust Variable Rep Rate control (if necessary) to obtain a stable pattern (locked to power-line frequency).

   c. Re-adjust Sweep Width controls, Var RF Level control, and CRO controls for an on-screen trace.

   d. Set the digital readout dial to 150.

   e. Turn the Tune control to vary the swept frequency over the UHF range. Swept frequency may be measured by changing output frequency of the external c-w generator to move the variable marker across detected sweep pattern. Frequency is read directly on tuning dial of the c-w generator.

2. VHF Mode.

   a. Set UHF-VHF switch to VHF position.

   b. Adjust Tune control to move UHF Center Frequency dial to VHF Set.

   c. Sweep center frequency is read on the digital readout dial. Vary the frequency from 500 kc to 300 mc, and measure swept range by moving the variable marker between sweep extremes.

D. Check 0.5 volt rms output.

   a. Set Operating controls as in paragraph C.1, except blanking switch set to Off.

   b. Connect bolometer to RF Out 50 Ohms jack.

   c. Adjust Var RF Level Adj control until bolometer indicates 5 milliwatts. Panel meter on 121-B should indicate approximately 0.5 volt rms.

   d. Turn the Tune control to vary the swept frequency over the UHF range. Swept output should be flat within ±0.25 db from 200 to 800 mc; ±0.5 db from 800 to 1050 mc.

   e. Repeat Step 'c', as for UHF. Vary the VHF Center Frequency control over entire range. Output should be flat within ±0.25 db.

   f. Disconnect the bolometer.

E. Check variable repetition rates.

   a. Provide a connection between Hor and Ext Mod jack and X-axis input terminal on the CRO.

   b. Set CRO for internal sweep operation.

   c. Set Ext Mod-Var-Line Lock switch to Var.

   d. Adjust Variable Rep Rate control over its range. Sweep repetition

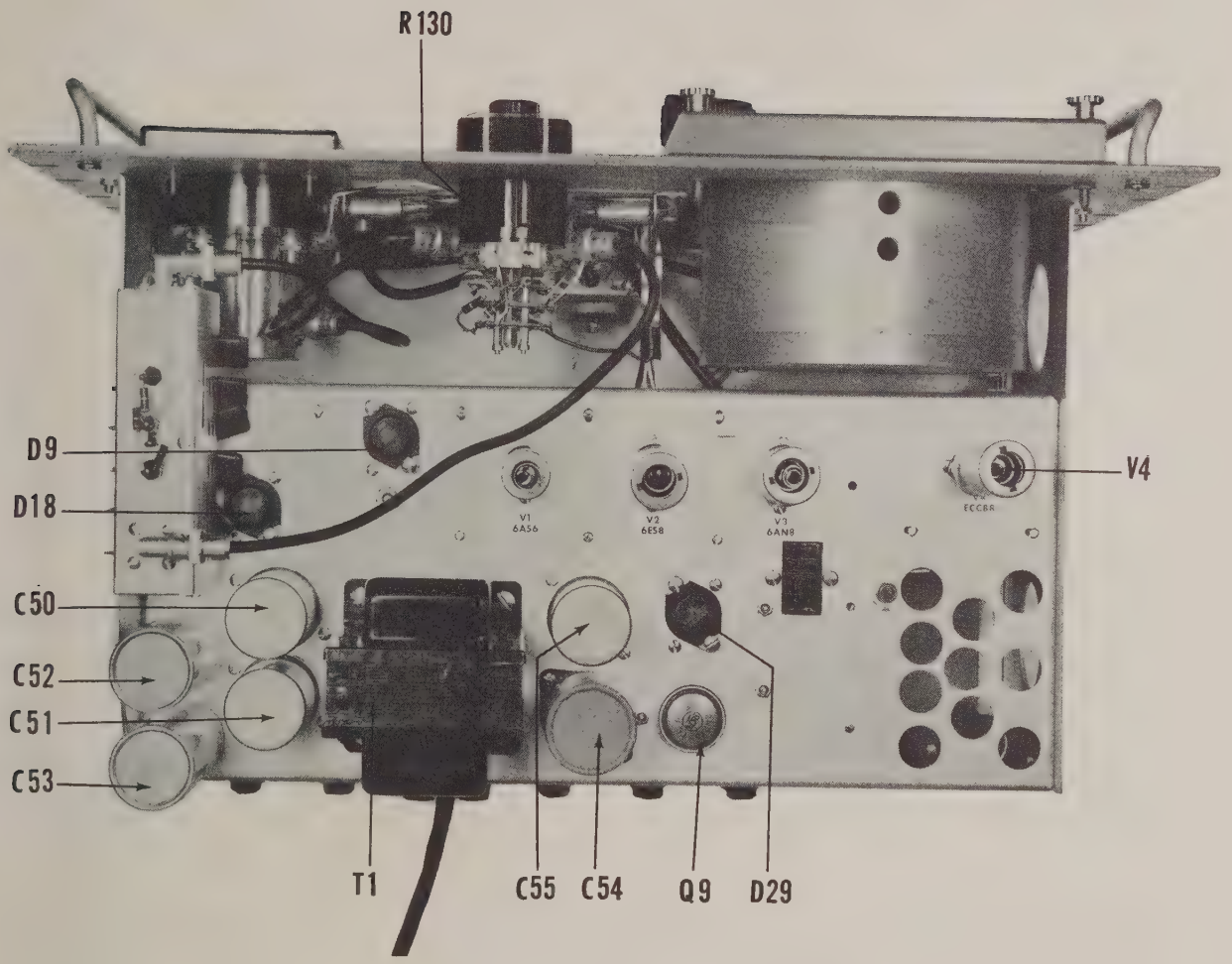


Fig. 4-2 Top view of chassis showing major components.

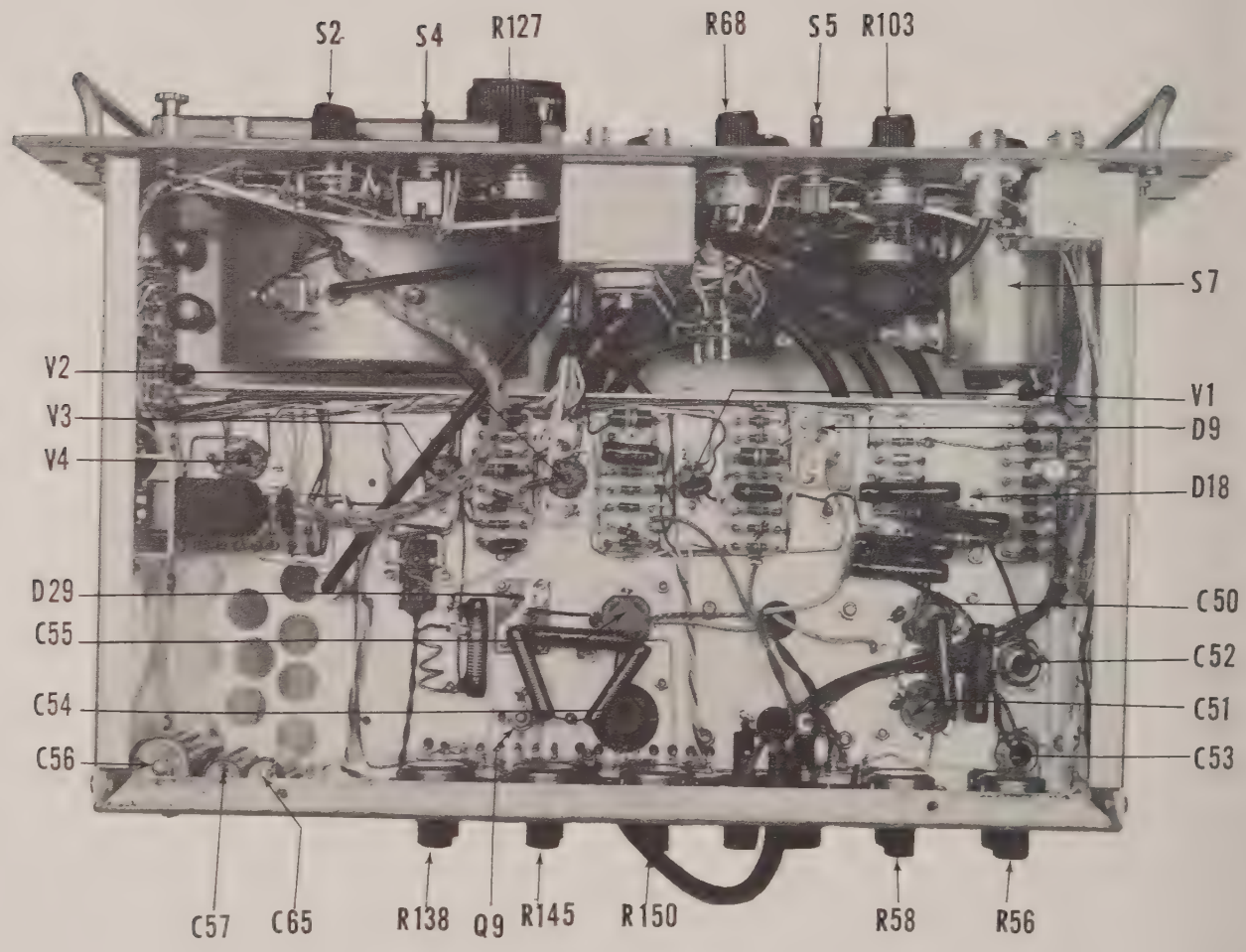


Fig. 4-3 Bottom view of chassis showing major components.

rate should vary approximately from 30 cps (33.3 mc) to 60 cps (16.7 mc).

e. Remove patch cord between CRO and Ext Mod jack.

F. Check harmonic markers (Optional circuitry).

a. Adjust controls for a stable, detected sweep envelope.

b. Set Harmonic Markers switch to 1, 10 or 100 mc, depending on sweep frequency and width in use. One or more markers should appear on screen. Marker amplitude can be adjusted with the Marker Gain control.

If any of the foregoing checks are not acceptable, refer to Section 4-4, Alignment Procedure.

4-3 TROUBLE-SHOOTING SUGGESTIONS.

SYMPTOM	PROBABLE CAUSE	COMPONENT OR CIRCUIT TO CHECK
1. No indicator light on UHF-VHF windows.	a. Blown fuse F-1.	a. Check fuse F-1. If new fuse blows, check power supply circuits for defective part or short circuit.
	b. Defective transformer T-1.	
2. No trace on CRO screen, indicator lights on.	a. Defective power supply.	a. Check power supply voltages- +150, -150 and +6.3v db. If +150v source is not within +20%, check D-9 and associated circuits. If -150v is not within ±10%, check D-18, D-19 and associated circuits. If 6.3v dc is not within ±0.1v db, check D-29 and associated circuits.
3. No horizontal deflection on CRO, no output at Hor Ext Mod jack.	a. Inoperative power supply.	a. Check power supply as in Step 2.
	b. Defective sweep generator.	b. Check V-1 and associated circuits.
4. Sweep does not lock to line frequency.	a. Defective diode D-32.	a. Check D-32 and associated circuits.
5. Incorrect sweep width and/or poor linearity.	a. Defective sweep shaper tube V-2.	a. Check V-2 and associated circuits.
	b. Linearity not adjusted properly.	b. Adjust linearity as described in Sect. 4-4, para. C.
6. No r-f output on UHF and VHF modes.	a. Defective UHF oscillator V-6.	a. Check V-6 and associated circuits.
	b. Fuse F-2 blown.	b. Check F-2. If new fuse blows, check UHF oscillator tube and agc circuit for shorts.

SYMPTOM	PROBABLE CAUSE	COMPONENT OR CIRCUIT TO CHECK
	c. Defective agc circuit.	c. Check V-3, V-4 and associated circuits.
7. No r-f output on VHF mode, but good output on UHF mode.	a. Defective VHF oscillator.	a. Check Q-1 and associated circuits.
	b. Defective VHF amplifier.	b. Check Q-2 thru Q-8 and associated circuits.
	c. Defective -30v supply.	c. Check Q-9, D-22 and associated circuits.
8. Output not flat on UHF or VHF modes.	a. Defective agc detector.	a. Check D-1 for UHF, or D-3, D-36 for VHF. Check associated circuits.
	b. Incorrect agc amplifier gain.	b. Select proper value for R-101 in accordance with Sect. 4-4B.
9. No marker output at Vert Out jack J-5 when signal of proper frequency is applied to J-3 or J-15.	a. Defective marker amplifier.	a. Check V-5, D-6 and associated circuits.

4-4 ALIGNMENT PROCEDURE.

The equipment listed in Sect. 4-2A is suggested.

A. Power Supply Adjustment.

a. Remove Multi-Sweep from cabinet.

b. Turn the instrument on.

c. Connect VTVM across D-19 and note that meter indicates -150v (±10%).

d. Connect VTVM across D-9 and note that meter indicates +150v (±20%).

e. Set UHF-VHF switch to VHF (to load the -30v supply), and connect VTVM across C-57.

f. Adjust R-92 (-30v) until VTVM indicates -30v (±0.5v).

g. Connect VTVM across C-7 and adjust R-97 until VTVM indicates +6.3v (±0.1v).

B. UHF Oscillator Adjustment.

a. Remove cover from UHF oscillator circuit compartment.

b. Provide a connection between RF Out jack J-2 and bolometer.

c. Set controls as follows:

RF Attenuator	0 db
Var RF Level	Fully clockwise
Blanking Switch	Off
UHF-VHF switch	UHF
VHF Center Freq.	150
Ext Mod-Var-Line Lock	Line Lock
Var Sweep Width	Fully CCW

d. Adjust R-61 (UHF Output Adj.) until bolometer indicates approx. 0.5 db above 5 mw.

e. Adjust C-2 until a flat response is obtained over entire UHF range (±0.25 db, 200 - 800 mc; ±0.5 db, 800 - 1050 mc).

f. When oscillator cover is replaced it may be necessary to select a new value for R-101 to accomplish this.

g. Disconnect bolometer.

C. VHF Oscillator and Linearity Alignment.

a. Connect equipment as in Fig. 4-1.

b. Remove shield cover from VHF circuit compartment.

c. Set VHF Center Frequency control to 150. Connect CRO probe to C-9. Turn Sweep Width control fully CCW. Adjust R-134 (Low Freq. Adj.) until voltage at C-9 is the same when Sweep Width switch is changed between Wide and Narrow positions. Turn Sweep Width control fully clockwise and Sweep Width switch to Wide position, and adjust R-141 (High Freq. Adj.) until sweep voltage at high-frequency end is approximately -80v. Now adjust R-138 and R-145 (Low Freq. Lin Adj. and Mid. Freq. Lin. Adj.) until sweep voltage at low-frequency end is approximately 0v, without any evident flattening of wave shape.

d. Set UHF-VHF switch to VHF and UHF Tune control to VHF Set, apply a 150-mc signal to Marker In jack (J-3/J-15). Adjust C-11 until center frequency is 150 mc, with Sweep Width control CCW.

e. Alternately adjust R-138, R-141 and R-145 until VHF center frequency dial tracks within approximately ±5%. It is also necessary that conditions of Step c are met.

f. Attach bolometer to RF Out jack (J-2), set Blanking switch to Off, and adjust R-60 (VHF Output Adj.) until r-f output is approximately 0.5 db above 5 mw.

g. Adjust C-66 until output is flat within ±0.25 db from 0.5 to 300 mc. (It may also be necessary to adjust L-12 thru L-16, and/or select a new value for R-74, if one or both diodes, D-3, D-36 are replaced).

h. Replace cover on VHF amplifier.

i. Repeat Step e.

j. Remove bolometer.

D. Narrow Sweep Adjustment.

a. Interconnect equipment as in Fig. 4-1.

b. Set UHF-VHF switch to VHF position.

c. Set digital frequency dial to 150 mc, Sweep Width switch to Nar, and Variable Sweep Width control fully clockwise.

d. Adjust output frequency of c-w generator until birdie marker appears at center of response curve.

e. Turn Variable Sweep Width control fully CCW.

f. Adjust R-150 (Centering Nar Swp) until marker appears at center of response.

g. Turn Variable Sweep Width control throughout its range, and note that the marker remains in approximate center of response curve.

h. Repeat Steps d thru g until no further adjustment is necessary.

E. Meter Adjustment.

a. Provide a connection between RF Out jack and bolometer.

b. Set UHF-VHF switch to UHF; Blanking switch to Off, and Variable Sweep Width control fully CCW.

c. Adjust Var RF Level Adj control until bolometer indicates 5 mw.

d. Adjust R-56 (UHF Meter Adj) until panel meter reads 0.5v rms.

e. Set UHF-VHF switch to VHF position, and UHF tune control to VHF Set.

f. Adjust Var RF Level Adj control until bolometer indicates 5 mw.

g. Adjust R-58 (VHF Meter Adj) until panel meter reads 0.5v rms.

SECTION V, LISTING OF REPLACEABLE PARTS

5-1 INTRODUCTION.

To maintain new-instrument performance when repairs are made, use only exact replacement parts, which are obtainable from Kay Electric Company. Reference the instrument type, serial number and circuit symbol number when ordering replacement parts.

5-2 LISTING OF REPLACEABLE PARTS, MULTI-SWEEP 121-B, Schematic No. D-7146-E.

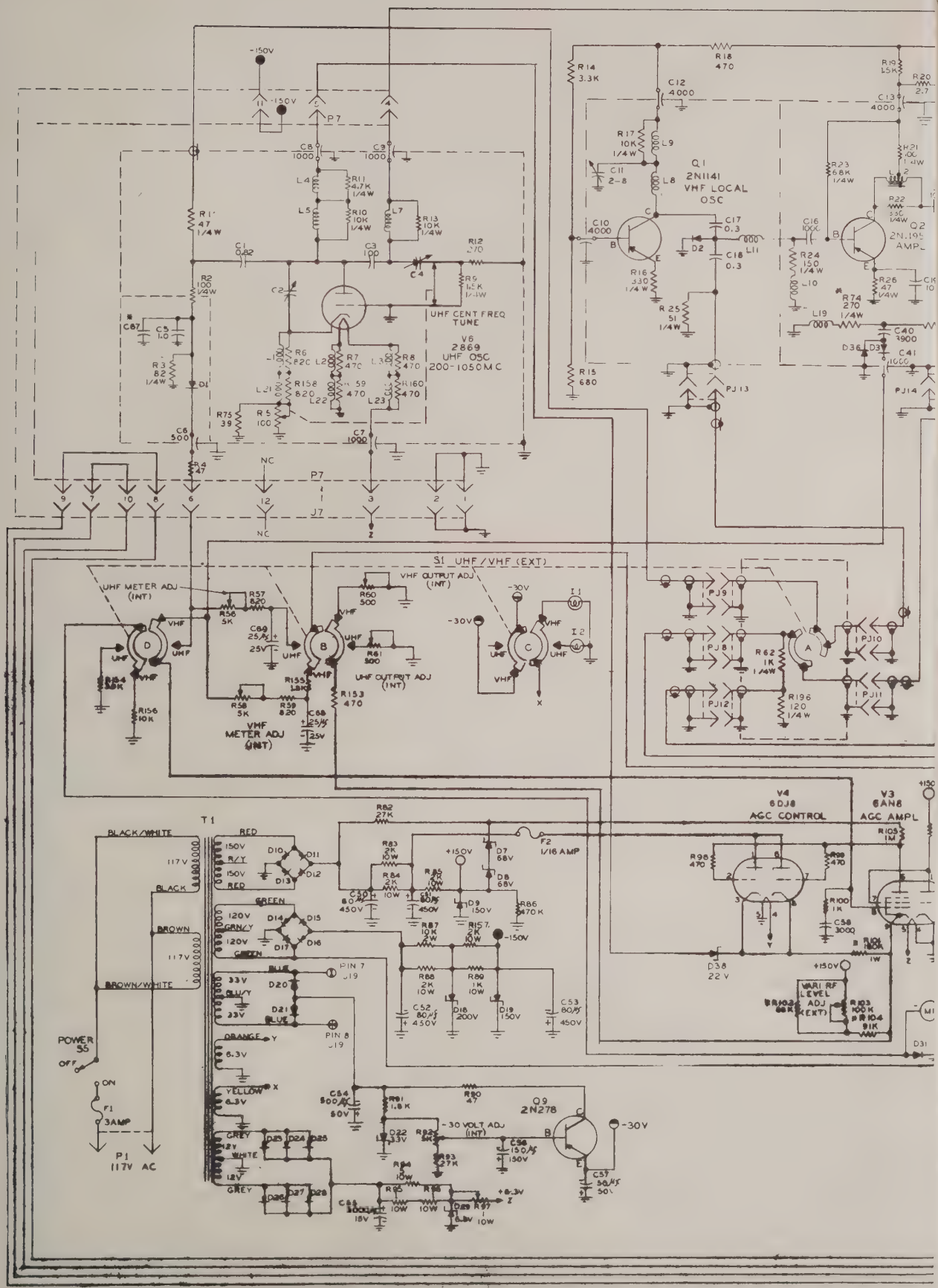
Dwg. Symbol No.	Description	Kay Part No.	Mfg. & Mfr. Designation
	CAPACITORS: (All capacitances in uuf, 500 volts unless otherwise indicated.)		
C1	0.82, ceramic tubular	6361-45	Quality Component QC .82
C2	Special, variable	7175	Kay Electric Co.
C3	100, special	C3/7146E	" " "
C4	10uuf at 4VDC, Varicap	7888	P.S.I. PC115-10
C5	1.0, ceramic, tubular	6361-47	Quality Component 1.0
C6	500, Button (feed thru)	7815	Erie 666000
C7 thru C9	1000, ceramic feed thru	6356-4	Erie X5V2443-1000GMV
C10	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GMV
C11	2-8, ceramic, trimmer	6358-12	Erie 538000 89R
C12 & C13	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GNV
C14	0.22uf, 50V, Mylar	6411-1	Goodall 601PE
C15 & C16	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C17 & C18	0.30, ceramic, tubular	6361-40	Quality Component QC.3
C19	10, silver mica	6359-53	Elmenco DM15-100
C20	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GMV
C21	0.22uf, 50V, Mylar	6411-1	Goodall 601PE
C22	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C23	10, silver mica	6359-53	Elmenco DM15-100
C24	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GMV
C25	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C26	10, silver mica	6359-53	Elmenco DM15-100
C27	0.22uf, 50V, Mylar	6411-1	Goodall 601PE
C28	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GMV

Dwg. Symbol No.	Description	Kay Part No.	Mfr. & Mfr. Designation
C29	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C30	10, silver mica	6359-53	Elmenco DM15-100
C31	0.22uf, 50V, Mylar	6411-1	Goodall 601PE
C32	4000, ceramic feed thru	6356-5	Erie X5V2443-4000GMV
C33	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C34	7, silver mica	6359-76	Elmenco DM15-070
C35	0.22uf, 50V, Mylar	6411-1	Goodall 601PE
C36	4000, ceramic feed thru	6356-5	Erie X52443-4000GMV
C37 & C38	7, silver mica	6359-76	Elmenco DM15-070
C39 & C40	3900, ceramic disc	6360-28	Erie Stype 4845 Z5P
C41	1000, ceramic feed thru	6356-4	Erie X5V2443-1000GMV
C42	Not used		
C43	500, 300V, silver mica	6359-66	Elmenco DM15-501
C44	Factory selected		
C45	500, button (feed thru)	7815	
C46	500, 300V, silver mica	6359-66	Elmenco DM15-501
C47	0.2uf, 75V, ceramic disc	6360-9	Gulton K8000V .2K
C48	0.001uf, ceramic disc	6360-2	Sprague 19C1A
C49	100, silver mica	6359-46	Elmenco DM15-1011
C50 & C51	40/40uf, 450V, electrolytic	6355-12	Mallory FP238
C52 & C53	80uf, 450V, electrolytic	6355-63	Aerovox Type GL450
C54	500uf, 50V, electrolytic	6355-33	Mallory WP065
C55	3000uf, 15V, electrolytic	6355-64	Mallory WP042A
C56	150uf, 150V, electrolytic	6355-40	Astron MM-150-150
C57	50uf, 50V, electrolytic	6355-60	Astron MM50-50
C58	0.003uf, 600V, Mylar-paper	6899-15	Elmenco 6DP-1-302
C59	500, 300V, silver mica	6359-66	Elmenco DM15-501
C60	0.02uf, 400V, Mylar-paper	6899-9	Elmenco 4DP-2-203
C61	0.005uf, 600V, Mylar-paper	6899-17	Elmenco 6DP-1-502
C62	0.25uf, 100V, Mylar-paper	6899-20	Elmenco 1DP-3-254
C63	0.01uf, 400V, Mylar-paper	6899-8	Elmenco 4DP-1-103
C64	0.25uf, 100V, Mylar-paper	6899-20	Elmenco 1DP-3-254
C65	50uf, 50V, electrolytic	6355-60	Astron MM-50-50
C66	4-30, ceramic trimmer	6358-6	Erie 503000 D2PO 24R
C67	Factory selected		
C68 & C69	25uf, 25V, electrolytic	6355-4	Astron MM-25-25
C70	0.22, ceramic, tubular	6361-46	Quality Component QC .22
	DIODES:		
D1 thru D6	D3530, silicon	6357-51	Sylvania D3530
D7 & D8	1N3040A, Zener	6357-33	Motorola 3/4 M68Z10
D9	1N2843, Zener	6357-45	Motorola 50M 150Z
D10 thru D17	F6, silicon	6357-3	Sarkes Tarzian F6
D18	1N2846R, Zener	6357-46	Motorola 50M200ZR
D19	1N3011RA, Zener	6357-50	Motorola 10M150ZR10
D20 & D21	F6, silicon	6357-3	Sarkes Tarzian F6
D22	1N3691A, Zener	6357-48	Motorola 1N3691A
D23 thru D28	F6, silicon	6357-3	Sarkes Tarzian F6
D29	1N2804A, Zener	6357-44	Motorola 50M6.8Z10
D30	1N3036, Zener	6357-37	Motorola 1N3036
D31 & D32	F6, silicon	6357-3	Sarkes Tarzian F6
D33	1N3685B, Zener	6357-49	Motorola 1N3685B
D34	1N3040A, Zener	6357-33	Motorola 3/4 M68Z10
D35	F6, silicon	6357-3	Sarkes Tarzian F6
D36	D3530, silicon	6357-51	Sylvania D3530
D37	F6, silicon	6357-3	Sarkes Tarzian F6
D38	3/4 M22Z10, Zener	6357-39	Motorola 3/4M22Z10
F1	Fuse, 3 amp, 250V	245	Bussmann AGC3
F2	Fuse, 1/16 amp, 250V	1751	Bussmann AGC 1/16

Dwg. Symbol No.	Description	Kay Part No.	Mfr. & Mfr. Designation
I1 & I2	Light indicator, Bayonet #44	249	General Electric #44
	CONNECTORS:		
J1	Not used		
J2	UG-1095B/U	7985	Dage UG-1095B/U
J3	UG-625/U	451	Dage UG-625/U
J4	UG-58/U	207	Dage UG-58/U
J5 & J6	UG-625/U	451	Dage UG-625/U
J7	S-312AB	4111	Cinch-Jones S-312AB
J8 thru J12	UG-185/U	204	Dage UG-185/U
J13 & J14	UG-535/U	6913	Dage UG-535/U
J15 & J16	UG-625/U	451	Dage UG-625/U
J17 & J18	UG-185/U	204	Dage UG-185/U
J19	S-308AB	401	Cinch-Jones S-308AB
	COILS:		
L1	On 820 ohm ½W resistor	L1/7146E	Kay Electric Co.
L2	On 470 ohm ½W "	L2/7146E	" " "
L3	On 470 ohm ½W "	L3/7146E	" " "
L4	On 4.7K ohm ¼W "	L4/7146E	" " "
L5	On 10K ohm ¼W "	L5/7146E	" " "
L6	Not used		
L7	On 10K ohm ¼W "	L7/7146E	" " "
L8	Special	L8/7146E	" " "
L9	On 10K ohm ¼ "	L9/7146E	" " "
L10	Special, resistor lead	L10/7146E	Sold with resistor R24
L11	Air, fixed	L11/7146E	Kay Electric Co.
L12	Special, variable	L12/7146E	" " "
L13	" "	L13/7146E	" " "
L14	" "	L14/7146E	" " "
L15	" "	L15/7146E	" " "
L16	" "	L16/7146E	" " "
L17	Air Fixed	L17/7146E	" " "
L18	Not used		
L19	Special	L19/7146E	Sold with resistor R-74
L20	Toroidal, 100 MH	1826	Torocoil Co.
L21	On 820 ohm ½W resistor	L21/7146E	Kay Electric Co.
L22	On 470 ohm ½W "	L22/7146E	" " "
L23	On 470 ohm ½W "	L23/7146E	" " "
M1	Meter, RF Output	7805	Simpson Model 1327
	PLUGS:		
P1	AC line cord, 3 wire	7166	Royal Electric Co.
P2 thru P6	Not used		
P7	P-312-CCT	454	Cinch-Jones P-312-CCT
P8 thru P14	UG-88/U	213	Dage UG-88/U
P15	Not used		
P16 thru P18	UG-88/U	213	Dage UG-88/U
	TRANSISTOR:		
Q1	2N1141	K-127	Motorola 2N1141
Q2	2N1195 (3)	K-128-3	" 1N1195
Q3	2N1195 (4)	K-128-4	" "
Q4	2N1195 (3)	K-128-3	" "
Q5	2N1195 (4)	K-128-4	" "
Q6	2N1195 (3)	K-128-3	" "
Q7 & Q8	2N1195 (5)	K-128-5	" "
Q9	2N278	K-116	Delco 2N278

Dwg. Symbol No.	Description	Kay Part No.	Mfr. & Mfr. Designation
	RESISTORS: (Unless otherwise specified, all resistors are fixed composition, ½ watt, 10% tolerance.)		
R1	47, ¼ watt	4701-C	Allen-Bradley CB4701
R2	100, ¼ watt	1011-C	" " CB1011
R3	82, " "	8201-C	" " CB8201
R4	47	4701-E	" " EB4701
R5	100, 2 watt pot variable	90	" " JA2NO48S101UE
R6	820, with coil (L-1)		See coil L1
R7	470, with coil (L-2)		See coil L2
R8	470, with coil (L-3)		See coil L3
R9	1.5K, ¼ watt	1521-C	Allen-Bradley CB1521
R10	10K, ¼ watt, w/coil (L-5)		See coil L5
R11	4.7K, ¼ watt, w/coil (L-4)		See coil L4
R12	270	2711-E	Allen-Bradley EB2711
R13	10K, ¼ watt, w/coil (L-7)		See coil L7
R14	3.3K	3321-E	Allen-Bradley EB3321
R15	680	6811-E	" " EB6811
R16	330, ¼ watt	3311-C	" " CB3311
R17	10K, ¼ watt, w/coil (L-9)		See coil L9
R18	470	4711-E	Allen-Bradley EB4711
R19	1.5K	1521-E	" " EB1521
R20	2.7, 5% tolerance	2P75-E	" " EB27G5
R21	100, ¼ watt	1011-C	" " CB1011
R22	330, ¼ watt	3311-C	" " CB3311
R23	68K, ¼ watt	6831-C	" " CB6831
R24	150, ¼ watt	1511-C	" " CB1511
R25	51, ¼ watt, 5% tolerance	5105-C	" " CB5105
R26	47, ¼ watt	4701-C	" " CB4701
R27	1.5K	1521-E	" " EB1521
R28	2.7, 5% tolerance	2P75-E	" " EB27G5
R29	100, ¼ watt	1011-C	" " CB1011
R30	330, ¼ watt	3311-C	" " CB3311
R31	68K, ¼ watt	6831-C	" " CB6831
R32	68, ¼ watt	6801-C	" " CB6801
R33	33, ¼ watt	3301-C	" " CB3301
R34	1.5K	1521-E	" " EB1521
R35	2.7, 5% tolerance	2P75-E	" " EB27G5
R36	100, ¼ watt	1011-C	" " CB1011
R37	330, ¼ watt	3311-C	" " CB3311
R38	68K, ¼ watt	6831-C	" " CB6831
R39	33, ¼ watt	3301-C	" " CB3301
R40	1.5K	1521-E	" " EB1521
R41	2.7, 5% tolerance	2P75-E	" " EB27G5
R42	100, ¼ watt	1011-C	" " CB1011
R43	330, ¼ watt	3311-C	" " CB3311
R44	68K, ¼ watt	6831-C	" " CB6831
R45	47, ¼ watt	4701-C	" " CB4701
R46	1.5K	1521-E	" " EB1521
R47	2.7, 5% tolerance	2P75-E	" " EB26G5
R48	100, ¼ watt	1011-C	" " CB1011
R49	330, ¼ watt	3311-C	" " CB3311
R50	68K, ¼ watt	6831-C	" " CB6831
R51	47, ¼ watt	4701-C	" " CB4701
R52	820	8211-E	" " EB8211
R53	27K, ¼ watt	2731-C	" " CB2731
R54 & R55	68, ¼ watt	6801-C	" " CB6801
R56	5K, 2 watt pot variable	119	" " JA2NO48S502UE
R57	820	8211-E	" " EB8211
R58	5K, 2 watt pot variable	119	" " JA2NO48S502UE
R59	820	8211-E	" " EB8211

Dwg. Symbol No.	Description	Kay Part No.	Mfr. & Mr. Designation
R60 & R61	500, 2 watt pot variable	100	Allen-Bradley JA2NO48S501UE
R62	1K, ¼ watt	1021-C	" " CB1021
R63	68, ¼ watt	6801-C	" " CB6801
R64 & R65	100, ¼ watt	1011-C	" " CB1011
R66	68, ¼ watt	6801-C	" " CB6801
R67	4.7K	4721-E	" " EB4721
R68	50K, 2 watt pot variable	119	" " JS2NO48P503UE
R69	820	8211-E	" " EB8211
R70	220	2211-E	" " EB2211
R71	33K	3331-E	" " EB3331
R72	47, ¼ watt	4701-C	" " CB4701
R73	330, ¼ watt	3311-C	" " CB3311
R74	Factory selected		
R75	Not used		
R76 & R77	150, ¼ watt	1511-C	" " CB1511
R78	100, ¼ watt	1011-C	" " CB1011
R79 & R80	82, ¼ watt	8201-C	" " CB8201
R81	47K	4731-E	" " EB4731
R82	27K	2731-E	" " EB2731
R83 thru R85	2K, 10 watt, wirewound	2021-K	Ohmite #1742
R86	470K	4741-E	Allen-Bradley EB4741
R87	10K, 2 watt	1031-H	" " HB1031
R88	2K, 10 watt	2021-K	Ohmite #1742
R89	1K, 10 watt	1021-K	" #1736
R90	47	4701-E	Allen-Bradley EB4701
R91	1.8K	1821-E	" " EB1821
R92	5K, 2 watt pot, variable	119	" " JA2NO48S503UE
R93	27K	2731-E	" " EB2731
R94	5, 10 watt, wirewound	5P01-K	Ohmite #1708
R95 & R96	1, 10 watt, wirewound	1P01-K	" #1701
R97	1, 10 watt, wirewound adj.	1P01-KA	" #1001
R98 & R99	470	4711-E	Allen-Bradley EB4711
R100	1K	1021-E	" " EB1021
R101 & R102	Factory selected		
R103	100K, 2 watt, pot variable	121	" " JA2NO48S104UE
R104	Factory selected		
R105	1M	1051-E	" " EB1051
R106	47K	4731-E	" " EB4731
R107	100K	1041-E	" " EB1041
R108	1.5M	1551-E	1 1 EB1551
R109	18K	1831-E	" " EB1831
R110	220K	2241-E	" " EB2241
R111	680K	6841-E	" " EB6841
R112	220K	2241-E	" " EB2241
R113	120K	1241-E	" " EB1241
R114	10K, .2 watt	1031-H	" " HB1031
R115 & R116	22K	2231-E	" " EB2231
R117	150K	1541-E	" " EB1541
R118	1M	1051-E	" " EB1051
R119	100K	1041-E	" " EB1041
R120	150K	1541-E	" " EB1541
R121	6.8K	6821-E	" " EB6821
R122	1M	1051-E	" " EB1051
R123	680K	6841-E	" " EB6841
R124	470K	4741-E	" " EB4741
R125 & R126	220K	2241-E	" " EB2241
R127	50K, 2 watt, pot, variable	117	" " JA2NO48S503UE
R128	18K	1831-E	" " EB1831
R129	2.7M	2751-E	" " EB2751
R130	1K, Helipot, variable	7725	Beckman Instr. Model C
R131 & R132	20K, 5% tolerance	2035-E	" " EB2035
R133	470	4711-E	" " EB4711


-150V
P7
C8 1000
C9 1000
L4
R11 4.7K 1/4W
L5
R10 10K 1/4W
L7
R13 10K 1/4W
R1 47 1/4W
C1 0.82
C3 100
R12 270
C4
R9 1.2K 1/4W
UHF CENT FREQ TUNE
C2
V6 2869 UHF OSC 200-1050MC
R2 100 1/4W
C67
C5 1.0
R3 82 1/4W
D1
R6 820
R7 470
R8 470
R158 820
R159 470
R160 470
R75 39
R5 100
C6 500
R4 47
C7 1000
NC
P7
J7
R14 3.3K
R18 470
C12 4000
R17 10K 1/4W
L9
C11 2-8
L8
Q1 2N1141 VHF LOCAL OSC
C10 4000
C17 0.3
D2
C18 0.3
L11
R16 330 1/4W
R25 51 1/4W
R15 680
PJ13
R19 15K
R20 2.7
C13 4000
R21 100 1/4W
R23 68K 1/4W
L12
R22 220 1/4W
C16 1000
R24 150 1/4W
L10
Q2 2N1951 AMPL
R26 47 1/4W
C14 10
L19
R74 270 1/4W
C40 3900
D36
D37
C41 1000
PJ14
S1 UHF/VHF (EXT)
UHF METER ADJ (INT)
R57 820
R56 5K
VHF OUTPUT ADJ (INT)
R60 500
R61 500
UHF OUTPUT ADJ (INT)
R58 5K
R59 820
R153 470
C69 25/25
VHF METER ADJ (INT)
R154 10K
R156 10K
I1
I2
-30V
PJ9
PJ8
PJ12
PJ10
PJ11
R62 1K 1/4W
R196 120 1/4W
T1
BLACK/WHITE
117V
BLACK
BROWN
BROWN/WHITE
RED
GREEN
BLUE
ORANGE
YELLOW
GREY
WHITE
150V
120V
33V
23V
6.3V
12V
D10
D11
D12
D13
D14
D15
D16
D17
D20
D21
D23
D24
D25
D26
D27
D28
PIN 7 J19
PIN 8 J19
POWER SS
OFF
ON
F1 3AMP
P1 117V AC
R82 27K
R83 2K 10W
R84 2K 10W
R85 10K 10W
R87 10K 2W
R157 2K 10W
R88 2K 10W
R89 1K 10W
C52 80/450
C53 80/450
C54 500/50
R91 1.8K
R90 47
Q9 2N278
-30 VOLT ADJ (INT)
R92 5K
R93 27K
C56 150/150
C57 50/50
R95 10W
R96 10W
R97 10W
D22 33V
D29 6.8V
F2 1/16 AMP
D7 68V
D8 68V
D9 150V
R86 470K
D18 200V
D19 150V
V4 6DJ8 AGC CONTROL
V3 6AN8 AGC AMPL
R98 470
R99 470
R100 1K
C58 3000
R101 180K 1W
D38 22V
+150V
VARI RF LEVEL ADJ (EXT)
R103 100K
R104 81K
D31
M1

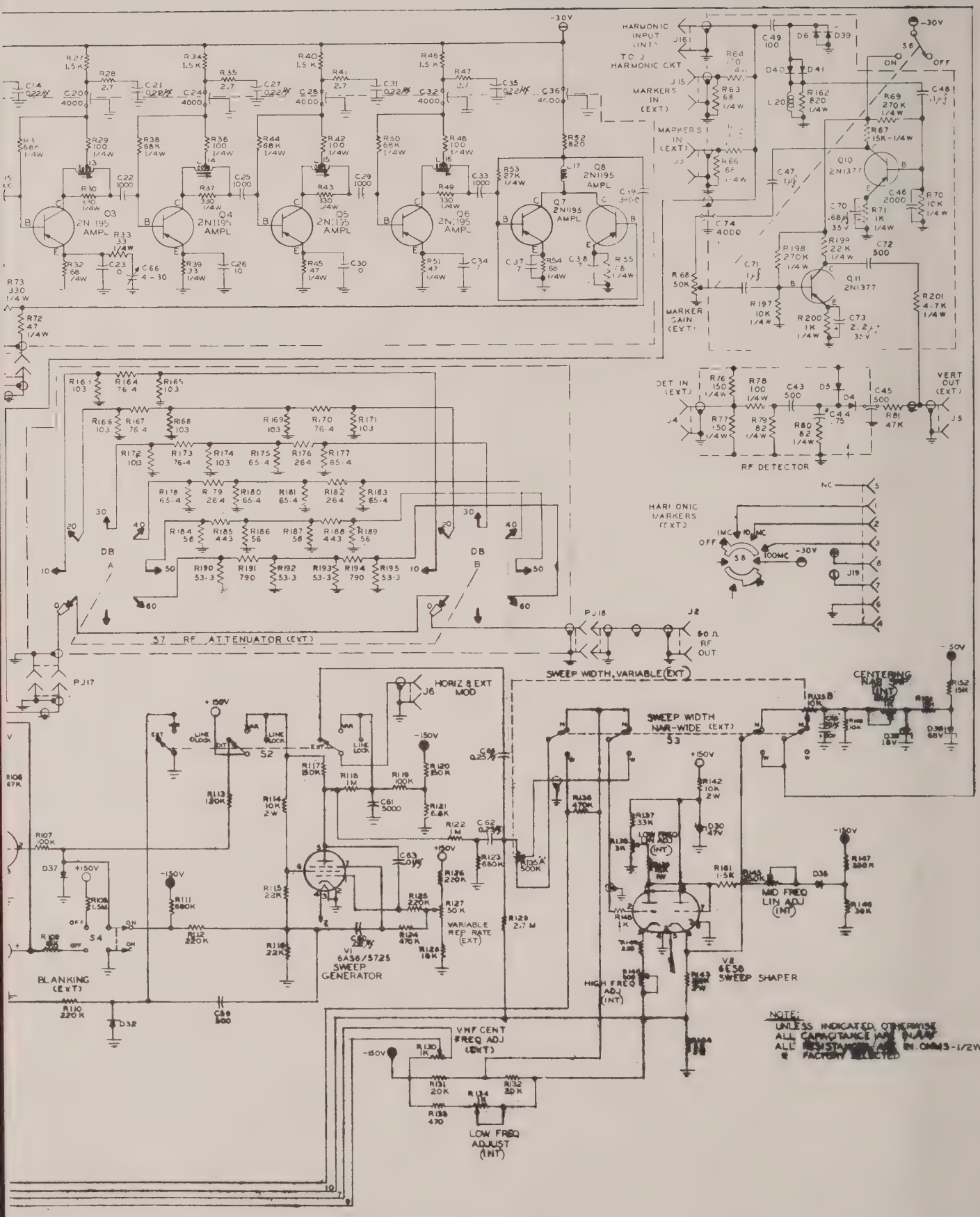
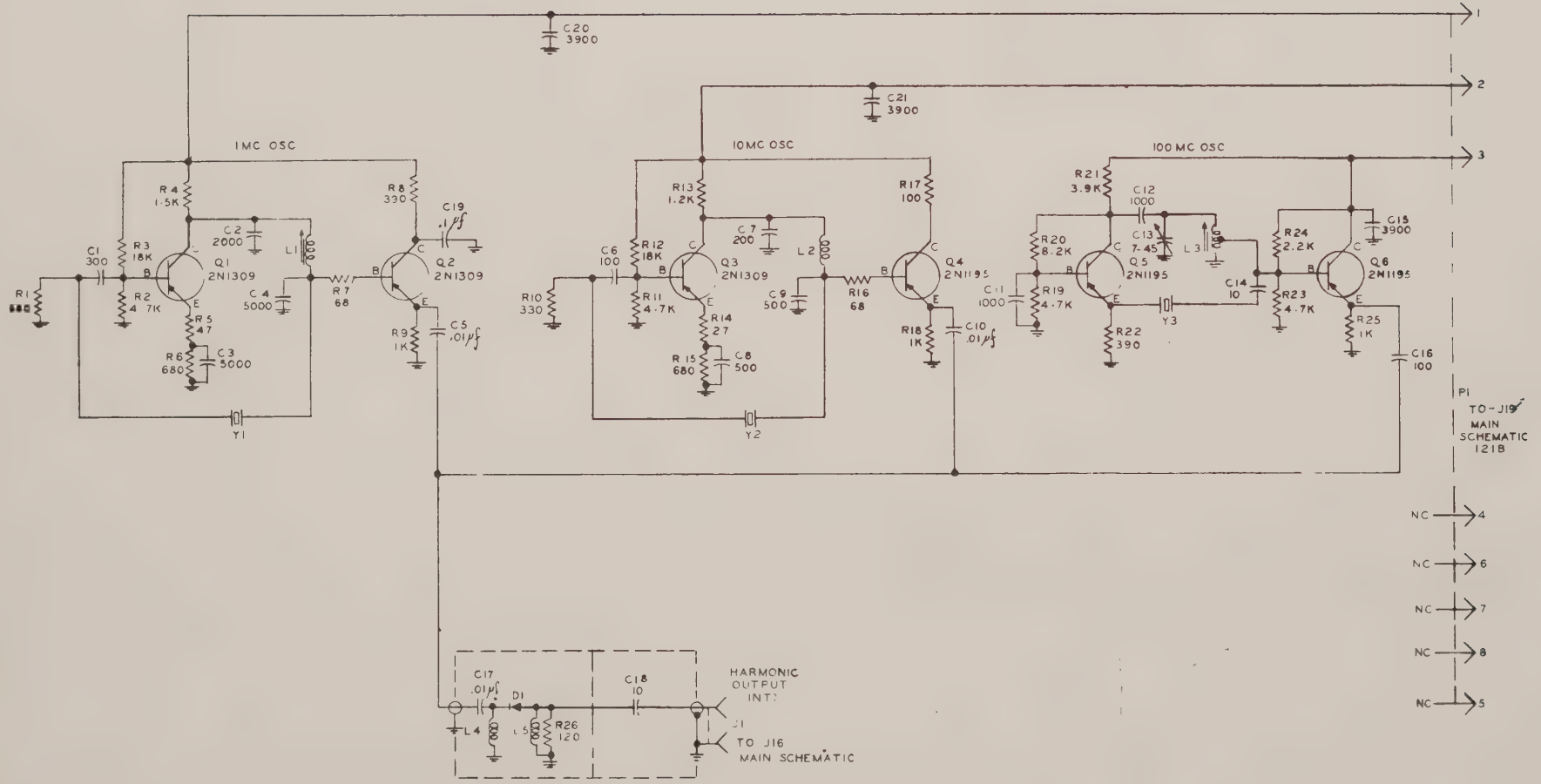


Fig. 5-1 Schematic D-7146E, 121B Multi-Sweep

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.	MFR. & MFR. DESIGNATION
R134	1K, 2 watt pot, variable	139	Allen-Bradley JA2NO48S102UE
R135 A & B	500K/10K, 2 watt dual pot	74	" " JU-2749-1051-P1
R136	470K	4741-E	" " EB4741
R137	33K	3331-E	" " EB3331
R138	3K, 2 watt pot, variable	107	" " JA2NO48S302UE
R139	18K, 1 watt	1831-G	" " GB1831
R140	220	2211-E	" " EB2211
R141	500, 2 watt pot, variable	100	" " JA2NO48S501UE
R142	10K, 2 watt	1031-H	" " HB1031
R143	22K, 2 watt	2231-H	" " HB2231
R144	5K, 5 watt wirewound	5021-J	Ohmite #1545
R145	250K, 2 watt pot, variable	123	Allen-Bradley JA2NO48S254UE
R146	39K	3931-E	" " EB3931
R147	330K	3341-E	" " EB3341
R148	1K	1021-E	" " EB1021
R149	10K	1031-E	" " EB1031
R150	1K, 2 watt pot variable	139	" " JA2NO48S102UE
R151 & R152	15K	1531-E	" " EB1531
R153	470	4711-E	" " EB4711
R154	3.9K	3921-E	" " EB3921
R155	1.8K	1821-E	" " EB1821
R156	10K	1031-E	" " EB1031
R157	2K, 10 watt wirewound	2021-K	Ohmite #1742
R158	820, with coil (L-21)		See coil L21
R159	470, with coil (L-22)		See coil L22
R160	470, with coil (L-23)		See coil L23
R161	1.5K	1521-E	Allen-Bradley EB1521
	SWITCHES:		
S1	Rotary, 4 wafer, 2 position	7787	Kay Electric Co.
S2	Rotary, 1 wafer, 3 position	7785	" " "
S3	Rotary, 1 wafer, 2 position	7786	" " "
S4	Toggle, DPDT	254-A	A-H & H #81027-CE
S5	Toggle, SPST	255-A	A-H & H #21350
S6	On R68		See R68
S7	Attenuator Assembly, 50Ω	8212	Kay Electric Co.
S8	Rotary, 1 wafer, 4 position	8289	" " "
T1	Transformer, power	A-7700A	Kay Electric Co.
	ELECTRON TUBES:		
V1	6AS6	6AS6	
V2	6ES8	6ES8	
V3	6AN8	6AN8	
V4	6DJ8	6DJ8	
V5	6AU6	6AU6	
V6	2869	2869	



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS
ALL CAPACITANCES ARE IN μμf
* FACTORY SELECTED

Fig. 5-2 Schematic C-8508A, Harmonic Markers Circuits

ADDENDUM

MULTI-SWEEP 121-B

Design changes in the Multi-Sweep have necessitated the following changes to schematic D-7146E (Fig. 5-1) and Listing of Replaceable Parts (Section 5-2). Changes pertain to all units having serial numbers higher than 26452 plus units having serial numbers 26428, 26373, 26431, 26426 and 26430.

Remove:

C-35
R-47
Connection between S-4 and ground.
R-109
Connection between pins 1 & 2, J-7.
Connection between pins 1 & 2, P-7.

Change:

C-17 from 0.3uuf to 0.1 uuf.
C-4 from 1000uuf to 4000uuf.
C-59 from 500uuf to 0.004uf.
D-32 to 6.8 volt zener diode (1N1510). Polarity should be opposite to that of original diode.

Add:

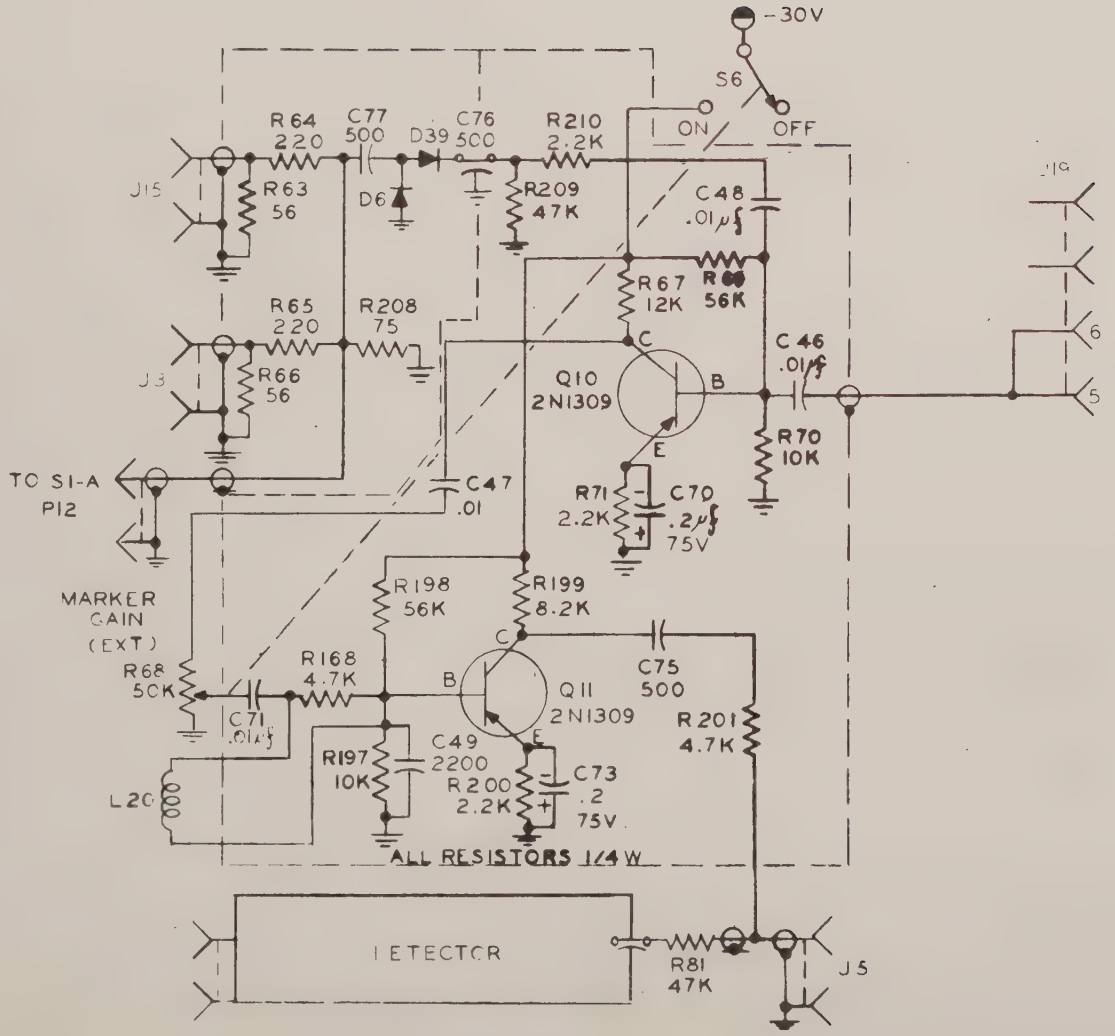
Connection between pin 12 (J-7) and previously grounded terminal of S-4.

18 K ohm resistor (designated R-109) between S-4 and ground (in place of removed ground connection).

Connection between pin 2 (J-7) and positive side of meter M-1.

0.02uf capacitor between R-110 and junction of D-16, D-17 and T-1.

The external marker detector and marker amplifier and wafer S-1A (UHF - VHF switch) are [redacted] wired in accordance with Fig. A, page 26.



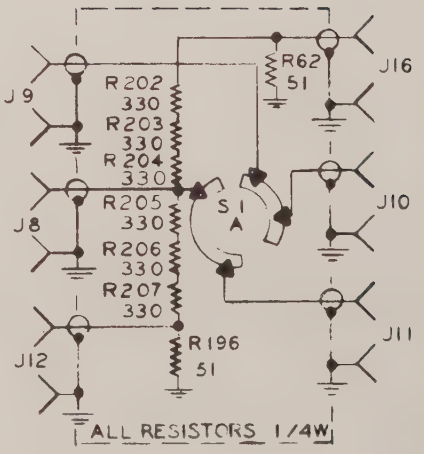


FIG. A, DWG. NO. B7146G/AD1

July, 1964

ADDENDUM #2

MULTI-SWEEP 121-B

Listed below are changes on units having serial numbers higher than 27783. Also, the following units are affected:

#26373	#26449	#27184	#27766
#26428	#26657	#27760	#27768
#26430	#27178	#27762	#27777
#26431	#27179	#27764	#27782

S1-A Wafer Circuit

Remove:

R-204, R-205, R-206, R-207

Change:

R-202 from 330 ohms to 1000 ohms.
R-203 from 330 ohms to 1000 ohms.

Add:

Jumpers in place of resistors that were removed.

Line Lock Circuit

Change:

R-110 from 220K to 22K.

-30 Volt Power Supply

Remove:

R-92, R-93

Change:

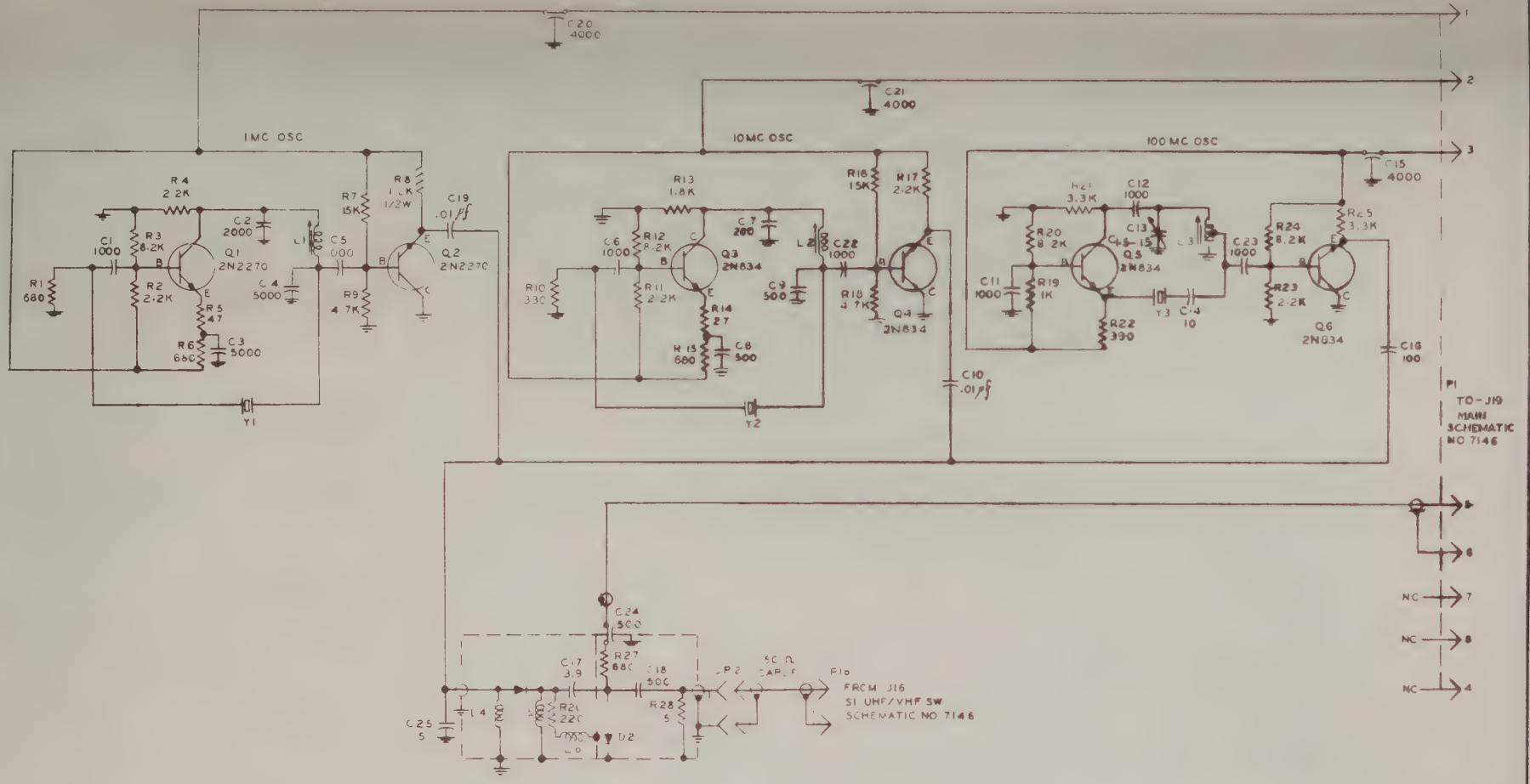
D-22 from 1N3691A to 1N3690B.
R-91 from 1.8K to 1.2K.

Add:

Jumper between C-22 anode and C-56(-).

Also, disregard references in paragraphs (1-6) and (4-4) concerning the adjustment of R-92. The -30 volt power supply is no longer adjustable.

For the correct wiring of the circuits mentioned see schematic D-7164H.



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4 W
ALL CAPACITANCES ARE IN µµf
* FACTORY SELECTED

FOR ALL UNITS HAVING SERIAL NUMBERS HIGHER THAN 26372, ALL HARMONIC MARKER CIRCUITS ARE WIRED IN ACCORDANCE WITH SCHEMATIC C8508-B

AUA SERIAL NO 263732

SCHEMATIC HARMONIC MARKERS CKTS MULTI-SWP 121B		
MAT.	FINISH:	SCALE:
TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMAL ± .005 FRACTIONAL ± 1/64 ANGULAR ± 30 MIN.	KAY ELECTRIC CO. PINE BROOK, N. J.	
CHANGE: OBY ECN No 112	DATE: 4-9-64 APP:	DWN BY AWP DATE 4-3-64
		APP BY DATE 4-4-64
		DWG. NO. C8508B

SCHEMATIC NO 8508

S1 UHF/VHF (EXT)

TO HARMONIC MARKER CKT

UHF METER ADJ (INT)

VHF OUTPUT ADJ (INT)

UHF OUTPUT ADJ (INT)

VHF METER ADJ (INT)

Q1 2N1141 VHF LOCAL OSC

Q2 2N1195 AMPL

Q3 2N1195 AMPL

Q4 2N1195 AMPL

Q5 2N1195 AMPL

Q6 2N1195 AMPL

Q7 2N1195 AMPL

Q8 2N1195 AMPL

Q9 2N278

Q10 2N1309

Q11 2N1309

V1 6AS6/5725 SWEEP GENERATOR

V2 6ES8 SWEEP SHAPER

V3 6AN8 AGC AMPL

V4 6DJ8 AGC CONTROL

V6 7913 UHF OSC 200-1050MC

UHF CENT FREQ TUNE

VARI RF LEVEL ADJ (EXT)

MARKER GAIN (EXT)

MARKERS IN (EXT)

DET IN (EXT)

VERT OUT (EXT)

RF DETECTOR

HARMONIC MARKERS (EXT)

S7 RF ATTENUATOR (EXT)

SWEEP WIDTH, VARIABLE (EXT)

SWEEP WIDTH NAR-WIDE (EXT) S3

HORIZ & EXT MOD

VHF CENT FREQ ADJ (EXT)

LOW FREQ ADJ (INT)

LOW FREQ LIN ADJ (INT)

MID FREQ LIN ADJ (INT)

HIGH FREQ ADJ (INT)

CENTERING NAR SWP (INT)

BLANKING (EXT)

VARIABLE REP RATE (EXT)

50 Ω RF OUT

ALL RESISTORS 1/4W

T1

F1 3AMP

F2 1/16 AMP

P1 117V AC

POWER S5

NOTE:
UNLESS INDICATED OTHERWISE
ALL CAPACITANCE ARE IN μμF
ALL RESISTANCES ARE IN OHMS-1/2W
* FACTORY SELECTED

AUA SERIAL NO. RACK 27781 & HEAD 28970

SCHEMATIC	MULTI SWEEP 121B		
MAT.	FINISH:	SCALE:	

DIMENSION TOLERANCES UNLESS OTHERWISE SPECIFIED.
DECIMAL DIMENSIONS ± .005 FRACTIONAL DIMENSIONS ± 1/64

CHANGE	DATE	APP.
1st ECN 858	12-12-64	J.U.

KAY ELECTRIC CO.
PINE BROOK, N. J.

DWN. BY A. ROGERS DATE 4-16-63
APP. BY J. WISNIOS DATE 5-6-63

DWG. NO. D7146 J

C-75 R-211 L23 D41 Q11 P120

92437